THE FIFTH GRADE

As an experiment for the current year we undertook to do away largely with the arbitrary classifying of human knowledge and school periods into the conventional academic subjects; we planned to substitute the study of what has taken the place of the home industries of town and farm, and of the quiet social delights of the home and plantation life of colonial days. In the curriculum, therefore, there is not the usual division into history, science, mathematics, etc. What is here gathered together is rather the science work selected out from the children's activities,—to some extent therefore, separated from the environment and correlations in which rest the mainsprings of motive and interest.

In organizing the problems of the curriculum it is well to bear in mind that the method of work will have much to do with the choice and organization of the material. We are trying to train the children in initiative, to choose what they should do and to do it with all their might; to plan to meet difficulties and overcome obstacles by thinking; to co-operate and aid mutually without disturbing; to find information; to ask sensible and helpful questions; to open up a subject for further study; and to see problems and interesting things to do in the commonest circumstances of their daily lives. No outline of work done can ever be followed strictly by a subsequent class, since the initiative of the second class would alter the problems and the make-up of the class would change the mutual aid and interests. Work done by a previous class never can appeal to a new group as an untried field does. Each year's work should be different from every previous one. It is not to be understood, therefore, that all of the following is the achievement of any one class within a year.

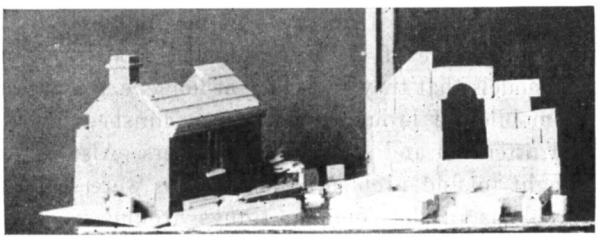
The children's initiative cannot start and supply all or even nearly all of the problems of the course. One of the greatest needs of training lies in educating pupils to find problems and recognize vital questions of lasting value in distinction from trivial questions that waste time and hinder progress. The teacher must, therefore, develop large and interesting problems with the class. The seven large type-studies that follow are intended to be of that character.

Furthermore, there should always be a convenient opportunity for the pupils to offer whatever they will that they think is interesting.

Such contributions are largely spontaneous in interest and initiative, since they grow out of what the children think or do or read or hear in their leisure time. This material will come in as unorganized scraps or suggestions and to a considerable degree irrelevant to any other work. The teacher is usually too preoccupied with his or her own outline of work to give deserving and unbiased welcome to these distracting questions. Many of them do, nevertheless, connect up with the large type-studies and should be brought into their proper relation to these. Others that are promising in value, even if they lead far afield from the teacher's outline, should be given time and attention. Those that seem unlikely to lead anywhere should be sidetracked. Finally a considerable number of such questions can be welcomed and answered in a manner satisfactory to the questioner but without taking much time, when the teacher decides they are not worth while to develop more fully with the class. Thus, one of the pupils announced one day that he was ready to explain the four-stroke cycle of the gas-engine. It developed into several lessons and started the type-study of the automobile. Many other problems grew out of these lessons. Another pupil brought a problem in construction of a meccano model of a derrick he had seen in use where a stone building was being constructed. The point was interesting and worth while but was not part of our year's outline. Another pupil wanted to build a dollhouse. We saw most elaborate and interesting dollhouses on one of our excursions, but I did not see my way clear to encourage the making of the dollhouse further than giving a few minutes' time to building with the wooden dometo or cement blocks. The problems in regard to the torpedo, submarine, and net to catch the U-boats were welcomed but quickly passed by as they did not promise so much as other questions before us.

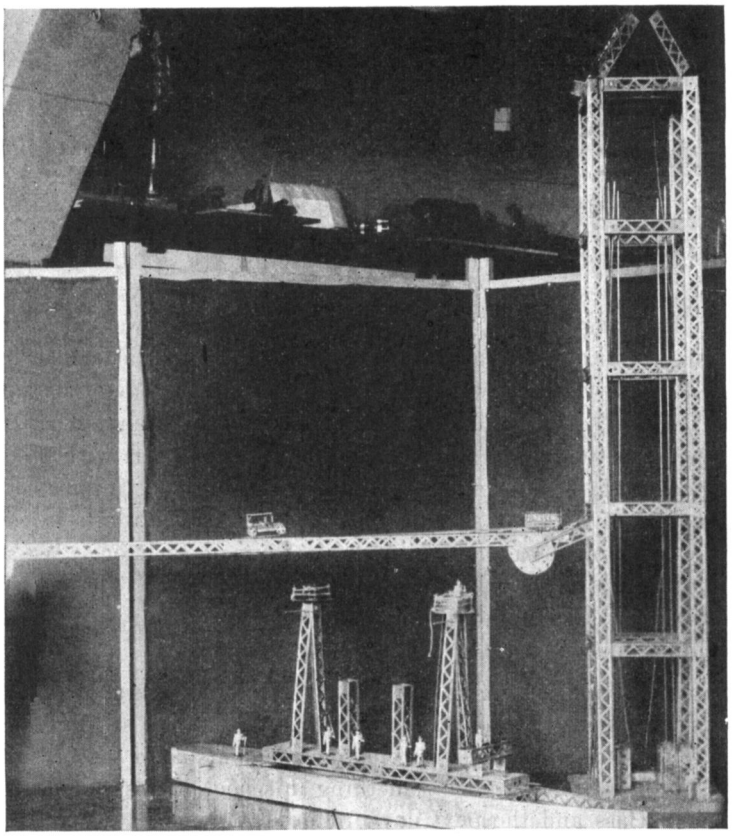
THE INDIVIDUAL PROJECT

All starting is difficult, partly because the pupils do not at first understand what they are expected to do, and partly because most of them have no established interests. A child's motives have a much narrower range because they are largely selfish. To develop responsibility it is necessary to make a pupil feel responsible to a group, to share what he knows and learns, and thus to be responsible for studying with intelligence. During the previous summer I had corresponded with the members of the class and had asked them what they wished to study in the coming school year. I got them to tell me what they



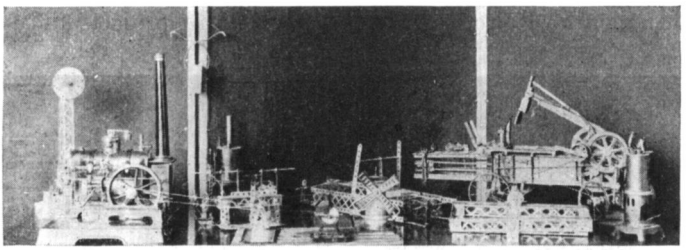
DOMETO AND CEMENT BLOCK CONSTRUCTION

did in their spare time. Later in the fall I asked them all to write what they would do if they had an hour a day available for individual work for a month. I also wrote out on paper many projects and posted



ERECTOR MODELS

them for the pupils to see. I put a lot of meccano and erector parts within their reach, some of it in constructed models. Some pupils brought other models that they had made at home, e. g., meccanograph, derricks, automobiles. I brought some partly finished jobs about the school to their attention and asked for volunteers. Also on excursions we always sought to find problems. Some trips were made expressly to see the problems in the common things around us, such as the operation of the sucker dredge in Lincoln Park, the reproduction in models of the derricks in use where buildings were being erected. To find how these worked and how to demonstrate their operation led to



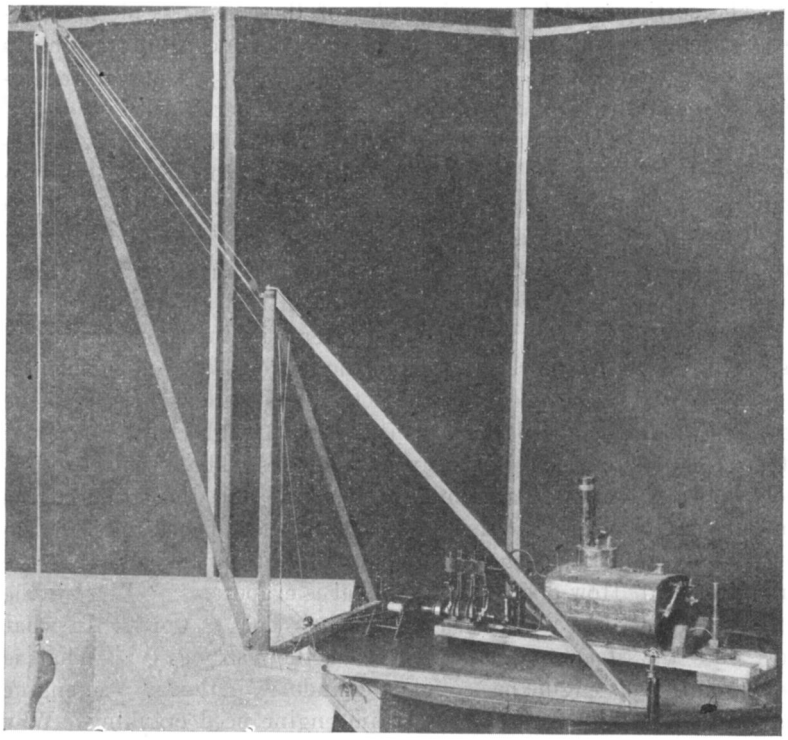
ENGINE RUNNING PLANER, BAILER, AND WINDMILL

numerous problems of mechanical construction, (e. g., the grasping-tongs of a derrick, the managing of the ropes and pulleys on a swing-derrick, the construction of a sheer-leg derrick, that we saw at the plant of the Chicago Shipbuilding Company, and an adjustable swing-arm drill that we also saw there). It is desirable to have the pupils tested frequently for interests and to ask their parents what the children do in their spare time. Thus I found one girl with an absorbing interest in caterpillars. Another is genuinely interested in the structure of the bony skeleton. As she put it, she wants to compare the skeleton of a monkey with the human skeleton. We are planning a series of visits to the Field Museum for her. These strong interests affect other children, and soon they are caring to plan and to do things likewise.

Some children, of course, show considerable perseverance in their interests. Whenever I find that a pupil is voluntarily seeking for a chance to do some work, or is working on a job outside of school, I feel pretty sure he will accomplish something in school. Thus, one boy got his idea in class and the next day produced a pair of tongs that he had made at home, out of wire. Another has followed up the study of

some of the constellations with an evening spent in star gazing at the school and is planning a school trip to the Academy of Science to see the Atwood Celestial Sphere.

We started out in September by a general survey of the city, the street plan, landmarks, routes, and sections of the city and environs. On these first excursions much other material was collected for a start in individual-pupil projects. The class was organized for work on problems. Those with ideas and capable of independent work, were given great freedom. Those needing directions and capable of following directions, were given positions of responsibility as secretaries and monitors. Those who showed neither originality nor responsibility were assigned to directed tasks under the leadership of other foremen or chairmen. Problems were written on cards and kept on file in a box until undertaken by a pupil. Projects under way were kept in a second box, and completed projects in a third filing-case.



STIFF-LEG DERRICK RUN BY MARINE ENGINE

The children reproduce what they see on excursions in drawings, models, and sand-table scenes. We use the meccano and erector sets, supplemented by extra pieces of tin and wire and building blocks. We build bridges, elevators, conveyors, boats, clocks, looms, derricks, sawmills, concrete-mixers, steam rollers, automobiles, steel skyscrapers, etc. We model in clay and paint in water-colors. We draw, model, and locate good examples of Gothic, Romanesque, Renaissance, and Colonial architecture. We collect and arrange in systematic order sets of specimens illustrating processes in the industries; also albums of pictures of Chicago scenes, and historical and geographical scenes in North America.

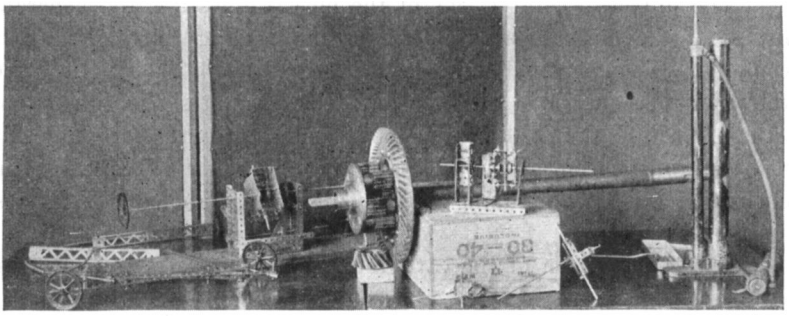
We list the foreign plants in the park conservatories, the sources of the building materials in interesting buildings, the specimens in the Field Museum, the chief manufacturing centers in the United States. We collect interesting advertisements that tell things worth while knowing and that offer pamphlets with further information.

The sorting and keeping in order of these papers, pictures, reports, specimens, and models, is one of the chief means of training to habits of order in work, and perseverance in study. The working together on committees develops the ability to co-operate with others.

As a sample of the development and treatment of a larger problem I shall take the one listed below as fifth in the outline of type-studies.

The problems of machine construction for the children very naturally associate themselves with the automobile, as that is the most generally interesting and familiar machine in their environment.

One day in the fall term our most versatile initiator announced his readiness to give the class a talk on the four-stroke cycle of the gas-engine. While I welcomed the subject, I was still surprised at the clearness with which he developed his points through chalk diagrams: intake, compression, power, and exhaust strokes. The essential differences between the internal combustion engine and the steam-engine came out pretty clearly. Other problems likewise opened up: Why do you have to crank a gas-engine? What are spark-plugs? What is the carburetor for? How does it work? What is evaporation? What is the cut-out? What does the muffler do and how does it work? In what ways does the steam-engine differ from the gas-engine? What is the reason the gas-engine has so many cylinders while the steam-engine has only one? Why does not the steam engine need cranking? Why does the steamer have an advantage on starting on a hill? What is the



PROBLEMS IN AUTOMOBILE CONSTRUCTION

arrangement of valves in the steam-chest? We had a toy steam-engine that we operated in the room and it showed the valve action pretty well. It also demonstrated the need of the flywheel.

We have Dyke's *Cyclopedia of the Automobile* with excellently clear diagrams, but all working parts that we can bring into the classroom or demonstrate on the running car when on school excursions, we use.

One of the boys made one of the simpler automobile models out of meccano. It had no differential. It took several lessons before the class took hold of the problem at all. I found they had never realized in their thinking any problem at all in making the driving-wheels turn a corner. One pupil thereupon built a rigid crown-gear drive to a single back axle and demonstrated what it could do and could not do in turning a corner. This performance was contrasted with the conditions that they all knew exist in any automobile whose rear wheels turn independently of each other. Quite a number of the class made a point of visiting the automobile show in the Coliseum to investigate special problems in the dissected demonstration chassis. One of our ablest mechanical geniuses has since constructed out of meccano parts a good working model of a regular automobile differential that shows perfectly how it is possible to transmit power to both wheels at the same time or to shift the power to either driving-wheel automatically as the car turns to the left or to the right. How is this managed when a steam locomotive goes around a curve?

The problems of the headlight, of the lighting system, of the generator, of the starting motor, of the speedometer, have come up and are within the children's interest and comprehension to a considerable extent.

The universal joint is one of the most interesting and generally useful of the mechanical problems of the driving-shaft. It can be completely demonstrated by meccano construction. The chain-drive, the transmission-gears, the camshaft that operates the intake and exhaust-valves, the link-chain speedometer, driving-shaft and the flexible transmission of power from wheel to wheel by coiled spring enclosed in a flexible tubing furnish absorbing problems of interest and value.

The construction of the carburetor can be made reasonably clear by dissected models.

One of the boys took up the problem of the construction of the air-pump and took a pump apart to learn its internal construction. Although it took him a good while to do the work he got a good deal out of it, as it was the first time he had ever taken any machine to pieces. Its action in pumping air is yet to be compared with the action of a water-pump in raising water and of a force-pump in delivering water under pressure in a pipe. We shall make models of both and have already visited pumping-stations.

In the fall the class went on excursions to see gas engines at work cutting silage and filling silos.

The work on the gas-engine has raised the question of the invention of the steam-engine and its effect on transportation and industry. The older methods of travel on foot and by horse and wagon, by row-boat and sailboat, are pictured and the effect on communication and travel is worked out. The fact that we are in an age largely dominated by the gasoline motor and electric motor is made clear. Thus, too, the great change known as the industrial revolution from the home industries to the factory system is illumined and seen from a different connection beside that of the development of the spinning and weaving mills under *Type-Study* No. II, *Textiles*.

TYPE STUDIES

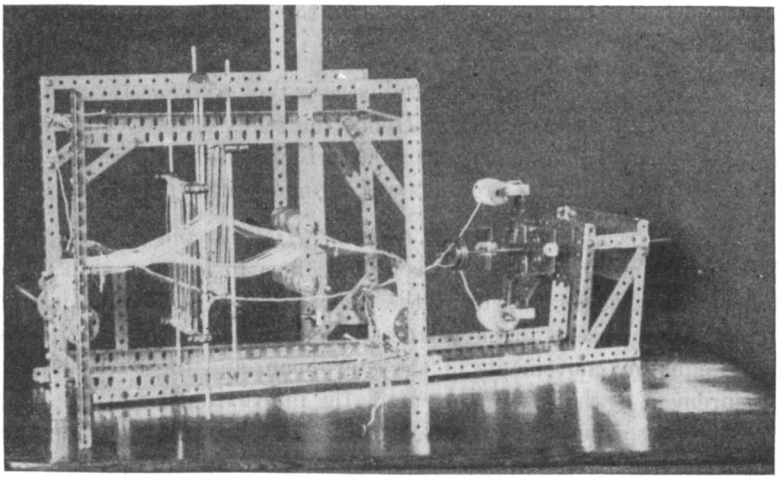
I. *Farming.*—This study is carried out by work in the school garden, by visits to farms, by classwork in recitations, by the making of models of farm machinery in the meccano sets, by excursions to museums and the International Harvester plant.

FALL.—Harvesting, corn-cutting, silo-filling, winter wheat.

WINTER.—Soils; plowing; harrowing; planting; cultivating; rainfall and snowfall in relation to winter and spring crops; relation of farming to other industries, and its relation to the winning the war.

SPRING.—The farmer's fight with insects and weeds; spraying and hoeing; the testing-boxes; seedlings; germination; garden work.

II. *Textiles.*—In this study we have made seven different sorts of hand-looms, spindles and distaffs, warping-frame, cord-machine for doubling thread, spinning-frame for hand-spinning; we have raised cotton, flax, and hemp in the school garden; we have retted and scutched and hackled the flax; we have spun on the hand-spindle and spinning-wheel; we have woven designs into cloth; we have visited the Hull House Museum and the Field Museum. This study is reported in *Year Book* Vol. IV, 1915.



MECCANO LOOM AND DOUBLER

III. *Wheat.*—In this study of the grains we take corn as the type, because of its size and abundance, to show the type features of a grain, in flower, stem, and leaf; we visited the flour-mill and we made a school model of a flour-mill; the bread-making in the domestic science room is followed by a visit to Schulze's bakery. The study of the wheat harvests of the world throughout the year reviews the seasonal relations of the great wheat areas and the mutual interest of all mankind in the world's bread production and bread rationing during the Great War. This study is reported in *Year Book* Vol. IV, 1915.

IV. *Chicago Industries.*—A different industry is studied intensively each year, the other chief industries sufficiently for purposes of

comparison and to understand Chicago's commerce, with the trade routes to and from Chicago. Thus, while we are studying ship-building in detail as a type, the other great industries of iron and steel, lumbering, furniture manufacturing, meat-packing, and the making of farm machinery, are related to the ship-building, and the goods brought to Chicago and those sent from Chicago are listed and studied.

V. *Automobile.*—The four-stroke cycle gas-engine; the comparison of the gas-engine with the steam-engine; the problems of the driving-wheels (differential), of the main drive-shaft (the universal joint), of the maintenance of engine-speed (the transmission), of the steering wheels (the steering knuckles); the changes in transportation and relation to the industrial revolution.

VI. *Cattle.*—The cow is studied as a type of domestic animal as well as of animals in general. Hence the study involves the general facts of animal life and particularly the relationship of the lower animals to man, animal products and animal training.

VII. *Problems Growing Out of History and Geography.*—Demonstrations that the earth is round; how to locate a ship's position on the trackless waste of the ocean; how to determine latitude and longitude; use of the astrolabe; change of seasons north and south of the equator; movements of the sun, moon, and the constellations; measurement of the size of the earth; the international date-line; food for exploring expeditions; Gulf Stream; trade winds; fur trade; tanning; the compass with its variations; the magnetic pole; glacial action, bending ice, moraines, and striae; sand-table constructions; etc.